FOREST SURVEY RELEASE NO. 6

SURVEY FILES

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Central File
No. 0.73
7-11

PRELIMINARY REPORT ON THE FOREST SURVEY

OF THE

BOTTOM-LAND HARDWOOD UNIT IN MISSISSIPPI

By

Southern Forest Survey Staff

Southern Forest Survey Staff *

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* The survey work in the Bottom-land Hardwood Unit in Mississippi was organized and directed by G. H Lentz who prior to 1932 was Acting Regional Survey Director.

Summary

Of the 4,420,400 acres in the Bottom-land Hardwood Survey Unit in Mississippi, 1,736,900 acres, or approximately 40 percent, is forest land. Eleven percent of the forest area bears uncut or lightly-culled old-growth timber stands. The remainder of the forest area is either cut-over timber land or supports a second-growth forest which may or may not be of merchantable size. On a very small percentage of the forest area all of the timber has been killed by fire or flood.

The net timber volume in the Unit, expressed in the Scribner log rule, is 2¼ billion board feet of high-grade[1], and 2½ billion board feet of low-grade[2] material. A part of the volume of high-grade timber is found in occasional trees scattered on areas already cut over. From the point of view of practicable logging, it is not now feasible to harvest all of this high-grade material.

Assuming an annual timber cut that is equal to the annual growth, the Bottom-land Hardwood Unit in Mississippi has a net annual growth of 190,730,000 board feet. The best available data on the volume of timber cut from the forests in the Unit fix the current annual drain at 193,820,000 board feet of material of saw-timber size. Thus the growth of high-grade and low-grade material combined is slightly less than the forest drain. Forty-six percent of the net timber growth of the Unit, or 86,850,000 board feet, is in high-grade material. This growth exceeds the drain of high-grade timber by 17,430,000 board feet. It must be remembered, however, that the growth of high-grade material is taking place on trees distributed widely throughout the unit; on the other hand, the drain of high-grade timber is chiefly confined to those restricted areas supporting heavy stands of old-growth timber or merchantable stands of second-growth.

[1] Net log scale at mill deck. This is the gross volume of high-grade timber less both woods cull and mill cull.

[2] Net log scale in the woods. This is the gross volume of low-grade timber less woods cull.

FOREST SURVEY RELEASE * NO. 6' November 30, 1934.

SOUTHERN FOREST EXPERIMENT STATION

New Orleans, La.

PRELIMINARY REPORT ON THE FOREST SURVEY OF THE BOTTOM-LAND HARDWOOD UNIT IN MISSISSIPPI

By

SOUTHERN FOREST SURVEY STAFF

I. F. Eldredge

Regional Director

* - This is an advance release of Forest Survey data that will later be published in complete reports. This information is subject to such correction or amplification as may be found necessary as computations proceed.

' - The first three releases of this series have been issued as Occasional Papers 31, 34 and 36 of the Southern Forest Experiment Station.

12/30/35

Russel Andrews returned from a trip thru Miss #1. In summary he had the following comments & made

1. Many plantations operate their own small saw mill, cutting wood for plantation use only. There may be as many as 50 of them. They did not have to report to the lumber code.
2. By not considering narrow strips of forest (less than 2 chains wide) the survey in this unit failed to get a certain part of the timber in the northern part of this unit. Some small commercial mills are now cutting cypress from these narrow stringers & nearly all of the plantation mills operate in this class of stuff.
3. Therefore, if we consider all drain against the forest we shall be underestimating drain. We are also underestimating somewhat the timber volume present.

PRELIMINARY REPORT ON THE FOREST SURVEY OF THE BOTTOM-LAND HARDWOOD UNIT IN MISSISSIPPI

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A word about the National Forest Survey

In 1928, through the McSweeney-McNary Forest Research Act, Congress authorized a national survey of the timber resources of the United States. The object of this Federal Forest Survey is five-fold: (1) To make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate of growth of the timber stands, (3) to determine the drain on the forests through industrial and local timber use, windfall, fire, flood and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, (5) to correlate these findings with existing and anticipated economic conditions, in order that policies can be formulated for the effective use of land suitable for forest production.

The nation-wide Forest Survey is an activity of the Branch of Research of the United States Forest Service. Within each region, the survey is conducted as a part of the work of the regional forest experiment station. The survey is now under way in the Pacific Northwest, California, the Northern Rocky Mountain region, the Lake States, and the South. Work will be undertaken progressively in other parts of the country until all the timber lands of the United States are covered.

Within the southern region survey work is undertaken in territorial units of 4 to 12 million acres. The boundaries of the units within each State conform, insofar as possible, with the boundaries of the major timber types, such as the longleaf pine type. For each unit a detailed report covering all phases of survey work will eventually be prepared. Meanwhile, upon completion of the office analysis of separate phases of the work, special preliminary reports will be issued. This publication is the first preliminary report for the Bottom-land Hardwood Unit of west Mississippi, and includes the principal statistics of the inventory, growth and drain phases of the survey. While the information here presented is thought to be substantially correct all data are subject to such modification as later and more detailed analysis may make necessary.

The field work of the Forest Survey in this unit was done by three-man crews, each of which consisted of an expert timber cruiser and two assistants. These crews gridironed the entire unit without regard to land ownership or occupancy. Sample plots were taken at intervals of 660 feet on parallel compass lines run in an east and west direction ten miles apart. The timber stand was sampled by counting the number of trees by diameter classes and species groups on the 2,301 quarter-acre forest-plots. Growth rates of individual tree species, and other special information, were obtained on randomly selected sample trees located on the sample plots.

Analysis has shown that for geographical units of 4 million acres or more this gridiron method of random sampling gives statistical results that are within the limits o dependability set up for the Forest Survey.

Description of the Bottom-land Hardwood Unit in Mississippi

Classification of land area by class of land use

This survey unit embraces an area of 4,420,400 acres of bottom land, which includes all of the flood plain of the Mississippi River lying in the State of Mississippi north of Vicksburg. The geographic location of the unit is shown in Figure 1. Characteristically the area is a relatively low-lying, featureless expanse sloping gently southward. In general its soils are very fertile and produce heavily when given proper drainage.

As shown in Table 1, approximately 50% of the area is now being farmed. Agriculture is an old and more or less stabilized industry in the unit, cotton farming being of major importance. A certain amount of land is cleared and put into cultivation each year. Accordingly, land clearing constitutes a definite drain upon the present timber resources. On the other hand, approximately 1.0 percent of the land area in the unit is abandoned for agriculture, probably on account of faulty drainage. Since natural reproduction on old fields is easily secured, much of this area will become forest land presently. In addition, approximately 1.7 percent of the land area is in the idle agricultural land class. A considerable part of this will presumably be abandoned and ultimately pass into second-growth timber land. Unless economoic conditions change perceptibly, therefore, the present area of forest land is not likely to be materially reduced as a result of land clearing.

Wood-using industries rank second in importance to agriculture in this unit. The forest occupies 39% of the total area. In the southern portion of the unit the forest industries predominate. Lumber companies and timber operators are important owners of timber land because they hold the principal supplies of merchantable timber. In the aggregate, however, plantation owners hold a greater acreage of the timber land than the lumber companies and timber operators. Much of the timber land held by plantation owners is imperfectly drained and probably will not be used for agriculture until prices of agricultural products increase perceptibly.

FIGURE 1

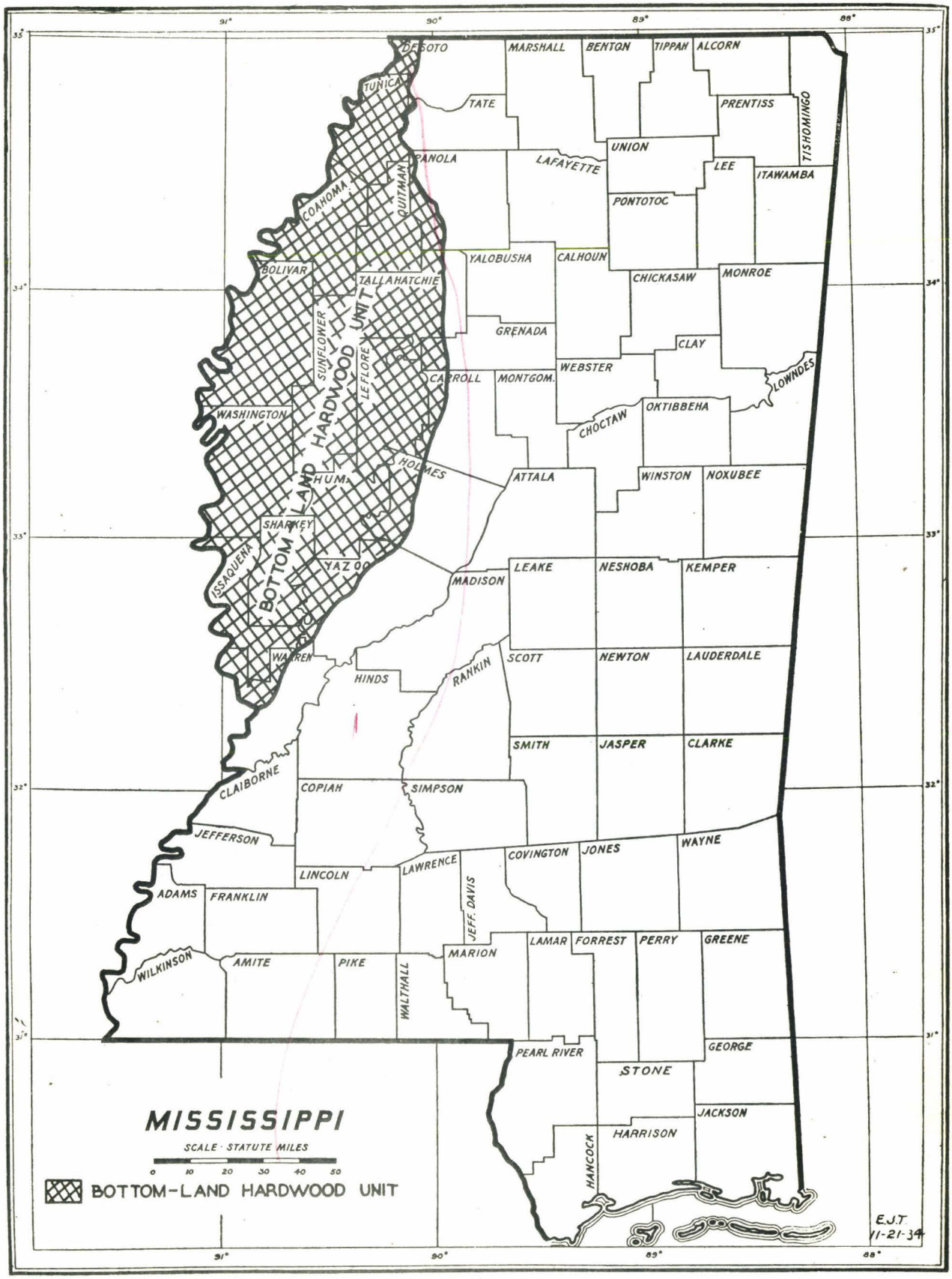
DESOTO
MARSHALL
BENTON
TIPPAH
ALCORN
TUNICA
TATE
PRENTISS
TISHOMINGO
UNION
PANOLA
LAFAYETTE
LEE
ITAWAMBA
PONTOTOC
COAHOMA
QUITMAN
YALOBUSHA
CALHOUN
BOLIVAR
CHICKASAW
MONROE
TALLAHATCHIE
SUNFLOWER
LEFLORE
GRENADA
CLAY
CARROLL
MONTGOM.
WEBSTER
LOWNDES
WASHINGTON
CHOCTAW
OKTIBBEHA
HOLMES
ATTALA
WINSTON
NOXUBEE
SHARKEY
ISSAQUENA
YAZOO
MADISON
LEAKE
NESHOBA
KEMPER
WARREN
HINDS
RANKIN
SCOTT
NEWTON
LAUDERDALE
SMITH
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
JEFFERSON
LINCOLN
LAWRENCE
COVINGTON
JONES
WAYNE
ADAMS
FRANKLIN
JEFF. DAVIS
LAMAR
FORREST
PERRY
GREENE
WILKINSON
AMITE
PIKE
WALTHALL
MARION
PEARL RIVER
GEORGE
STONE
JACKSON
HARRISON
HANCOCK
MISSISSIPPI
SCALE · STATUTE MILES
0 10 20 30 40 50
BOTTOM-LAND HARDWOOD UNIT
E.J.T
11-21-34

FIGURE 1a.

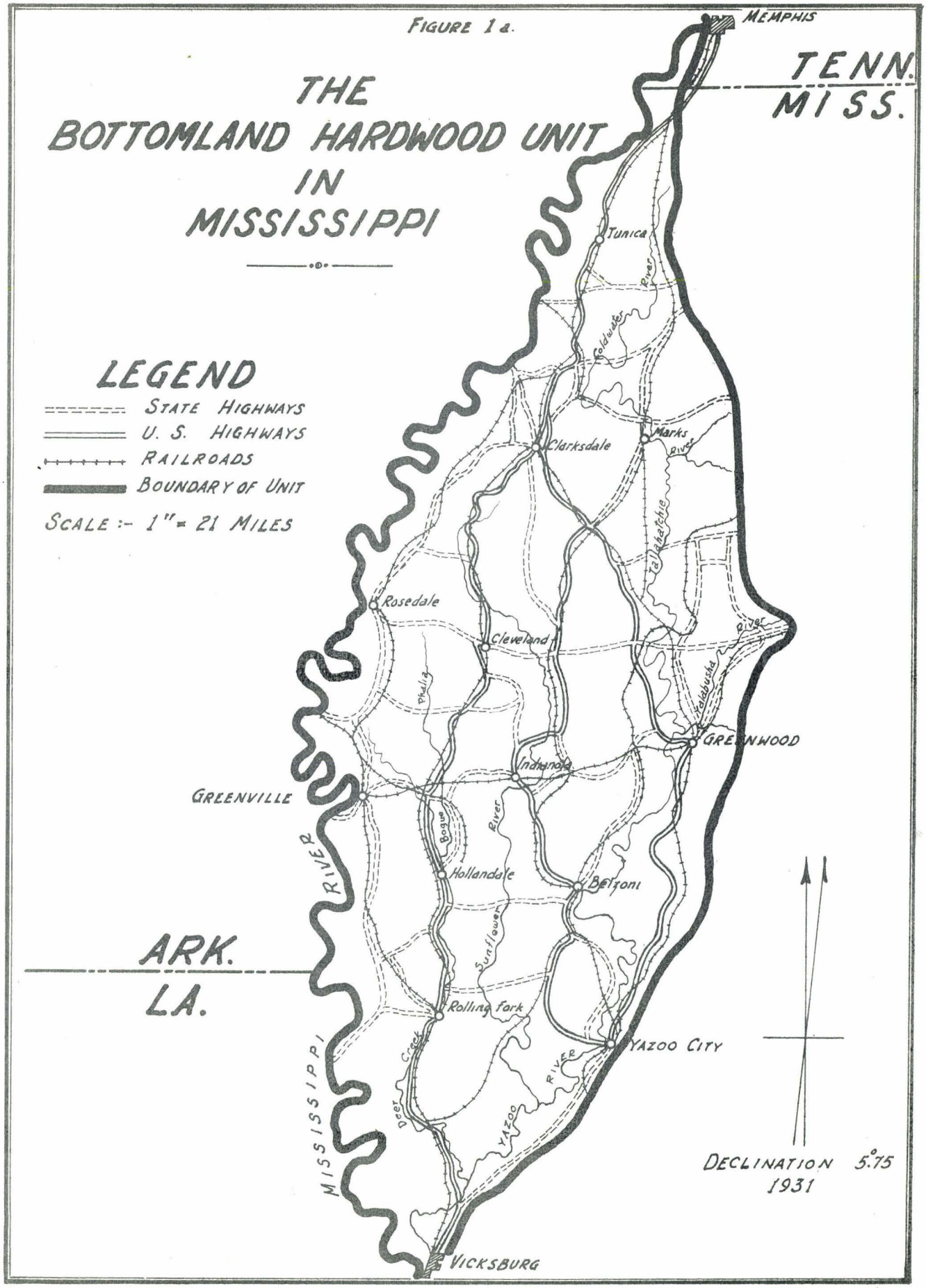
THE
BOTTOMLAND HARDWOOD UNIT
IN
MISSISSIPPI
LEGEND
STATE HIGHWAYS
U. S. HIGHWAYS
RAILROADS
BOUNDARY OF UNIT
SCALE :- 1" = 21 MILES
MEMPHIS
TENN.
MISS.
ARK.
LA.
Tunica
Coldwater River
Clarksdale
Marks
Tallahatchie River
Rosedale
Cleveland
Yalobusha River
GREENWOOD
Indianola
GREENVILLE
Bogue Phalia
Hollandale
Belzoni
Sunflower River
Rolling Fork
YAZOO CITY
Deer Creek
Yazoo River
MISSISSIPPI RIVER
VICKSBURG
DECLINATION 5.°75
1931

Table 1. - Distribution of land area by class of land use, in the Bottom-land Hardwood Unit in Mississippi

Land use classes	Area in acres		Percent of total area
Forest:		1,736,900	39.3
Nonforest:			
Agricultural:			
In cultivation:			
Old crop land [1]	2,192,100		49.6
New crop land [2]	127,600		2.9
Out of cultivation:			
Idle [3]	74,700		1.7
Abandoned [4]	46,100		1.0
Pasture:			
Improved [5]	27,900		.6
Woodland [6]	29,400		.7
Other areas:			
Levees, roads, railroads, towns, waterways	185,700		4.2
Total nonforest		2,683,500	60.7
Total forest and nonforest		4,420,400	100.0

[1] Land cultivated at least 5 years and on which a farm crop was raised within 2 years prior to date of survey.

[2] Land recently converted from forest to crop land. Stumps or standing dead trees are present. Dead hardwood trees and stumps usually decay and disappear within 5 years.

[3] Cultivated land that has not produced a farm crop for two years or more, but which has not reached the abandoned class.

[4] Land once cultivated but showing distinct evidence of having been out of cultivation for at least five years; no attempt is being made to keep it as pasture.

[5] Cleared land under fence used for grazing. A real attempt has been made to produce and maintain a sod.

[6] More or less wooded areas under fence used primarily for grazing. Usually no attempt has been made to improve the sod.

Description of the Forest Area

For descriptive purposes the forest area has been classified into (a) topographic situations, primarily on the basis of drainage, (b) forest conditions on the basis of stand age and logging history, and (c) forest types on the basis of association of tree species. The descriptive terms used in these classification systems are defined as follows:

Definitions of topographic situations

Swamp - Forested areas that are usually under water a large part of each year.

Batture[1] - Land lying between the levee and the river, and thereby subject to overflow; also, similar land located along sections of river banks where no levees exist.

Bottoms[1] - All land not described as batture or swamp.

Definitions of forest conditions

Old-growth - Stands which have the superficial characteristics of the original mature forests of the region and forest type. There has been no cutting, except perhaps an occasional tree for some special product.

Old-growth culled - Old-growth stands from which an appreciable quantity of high-grade timber has been removed. These stands contain, however, a sufficient volume of material of saw-log size and quality to justify another operation.

Old-growth cut-over - Old-growth stands from which practically all trees of merchantable size and quality have been removed, leaving too small a volume per acre to justify another logging operation in the immediate future.

Second-growth - Stands of young timber one inch and over in diameter at 4½ feet above the ground, which have come in after cutting, hurricane, fire or previous cultivation. These stands may contain a few residual trees from the former old-growth stands, but the present forest is predominantly second-growth. Trees in these stands range in size from those recently established to those that are now merchantable. The stands may be uncut, or, if only on occasional tree has been removed, lightly cut.

Second-growth cut-over - Second-growth stands that have been given a harvesting cut, leaving an insufficient number of trees of merchantable size and quality to justify immediate further cutting.

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[1] Although the following tables show only the forest area in batture and bottoms, agricultural land is also found in the bottoms and to a very limited extent on the batture.

Fire- and flood-killed' - Forest areas on which practically all of the trees have been killed by fire or flood.

The forest area classified by forest conditions and topographic situations is shown in Table 2.

Table 2. - Forest area by forest conditions and topographic situations

Forest conditions	Topographic situations			Total	Percent of total forest Area
	Swamp	Batture	Bottoms		
	----------Area in acres----------				
Old-growth	4,500	30,200	58,100	92.800	5.3
Old-growth culled	19,600	2,300	77,000	98,900	5.7
Old-growth cut-over	45,300	15,100	333,700	394,100	22.7
Second-growth	65,700	176,600	630,300	872,600	50.2
Second-growth cut-over	17,400	30,200	193,200	240,800	13.9
Subtotal	152,500	254,400	1,292,300	1,699,200	97.8
Fire- and flood-killed'	8,300	5,300	24,100	37,700	2.2
Total	160,800	259,700	1,316,400	1,736,900	
Percent of total forest area	9.2	15.0	75.8		100.0

'Since the fire-killed and flood-killed conditions combined occupy only 2.2 percent of the total forest area, the accuracy of area estimates of either condition alone is insufficient to warrant its use.

Definitions of forest types

Cypress-hardwood - Two distinct phases of this type can readily be identified, (a) the cypress and/or tupelo-gum phase found in the swamps, and (b) the cypress-mixed hardwood phase usually found on clayey flats. For this preliminary report the two phases of the cypress-hardwood type have been combined, because the cypress-mixed hardwood phase occurs infrequently in the unit.

(a) Cypress and/or tupelo-gum phase - Cypress in wet swamps, occurring either in pure stands or in mixture with tupelo gum and other hardwood species. Cypress makes up 40 percent or more of the merchantable volume of the stand, or 40 percent or more of the number of dominant and codominant trees. Red maple, planer tree, water locust, and in some instances willow, are common associates of the cypress. Many of the cypress stands have been heavily cut over and very little old-growth cypress remains in the Unit.

(b) The cypress-mixed hardwood phase - Found on areas that are only occasionally inundated and are not true swamps. Cypress makes up 25 to 40 percent of the merchantable volume of the stand, or 40 percent of the number of dominant and codominant trees. Overcup oak, green ash, red gum, Nuttall's oak and other hardwoods are common associates of cypress. This phase of the type has often developed as a result of changes in drainage conditions.

Cottonwood-willow - A river-margin type. In this Unit it is chiefly found along the banks of the Mississippi, Yazoo and Sunflower Rivers. Although the cottonwood and willow may be associated, they are commonly found in pure stands of one species or the other. Willow is often found on low flats along the river's edge; cottonwood on the higher, sandier portions of the river bank. The rapid growth of cottonwood and willow, and the proximity to cheap water transportation, make this type commercially important. The lumber cut of several mills along the Mississippi River depends largely on the cottonwood and willow logs obtained from the batture and from river islands.

Overcup oak-water hickory - Found on the poorly drained, clay flats and at the edges of swamps. From a standpoint of merchantable value and growth this type is the poorest in the unit. The overcup oak and water hickory together make up at least 60 percent of the stand volume, or in young stands at least 60 percent of the number of dominant and codominant trees. American elm, cedar elm, persimmon, Nuttall's oak and green ash are common associates.

Mixed hardwood - Stands in which, as a rule, no single tree species or small group of tree species makes up more than 30 percent of the stand, by volume or by number of dominant and codominant trees. In the old-growth mixed-hardwood stands, the chief species are red gum, various red, white and water oaks, elms, ash and pecan. The cut-over stands may contain the same species, but with a greater representation of oak, elm, ash, and in addition, hackberry. Red gum is sometimes found in pure, or practically pure, stands on abandoned fields.[1] Extensive areas of pure, virgin red gum occur occasionally, but they are rare.

[1] The accuracy of the area estimate of the pure red gum type was found to be too low to warrant its segregation as a distinct type. For this reason, it has been combined with the mixed hardwood type.

The forest area classified by forest conditions and forest types is shown in Table 3.

Table 3. - Forest area by forest conditions and forest types

Forest conditions	Forest types				Total	Percent of total forest area
	Cypress-hardwood	Cottonwood-willow	Overcup oak-water hickory	Mixed hardwood		
	Area in acres					
Old-growth	6,000	----	25,700	61,100	92,800	5.3
Old-growth culled	21,900	----	40,000	37,000	98,900	5.7
Old-growth cut-over	51,300	----	82,300	260,500	394,100	22.7
Second-growth	47,600	138,100	66,400	620,500	872,600	50.2
Second-growth cut-over	10,600	18,900	3,800	207,500	240,800	13.9
Subtotal	137,400	157,000	218,200	1,186,600	1,699,200	97.8
Fire- and flood-killed	3,000	2,300	4,500	27,900	37,700	2.2
Total	140,400	159,300	222,700	1,214,500	1,736,900	
Percent of total forest area	8.1	9.2	12.8	69.9		100.0

Volume Estimate

Merchantable timber area

In general, the stands of timber of saw-log size in the bottom-land hardwood unit of Mississippi have been cut over at least once for lumber or other forest products. These cut-over stands are characterized by the presence of trees that were considered unmerchantable at the time of the previous logging. The remnant trees are associated with such young growth as has developed since the logging. Owing to changes in the lumber market and other economic circumstances, some of these residual trees are now merchantable, but many of them are of such low grade or are so defective that they presumably will never have value for lumber or other forest products requiring high quality timber.

From the immediate industrial standpoint, it is important to determine the area of accessible forest land bearing stands of timber of sufficient value to warrant immediate logging. In general, the bottom-land hardwood timber stands are accessible. In this report, any area supporting 2,500 board feet of timber per acre has been considered merchantable. It must be clearly understood, however, that this volume per acre includes, in addition to the high-grade material (see page 11), the volume of timber that is suitable only for ties, timbers, staves, and rough-structural and small-dimension lumber. Prior to the present depression period, sawmill operators had been truck-logging areas having no more than 1,000 to 1,500 board feet of high-grade timber per acre. On the average, stands of 2,500 board feet per acre of all grades of material produce about 1,000 board feet of high-grade timber. Accordingly, stands bearing 2,500 board feet per acre are considered merchantable. In forest types where species of low commercial value are predominant, notably the overcup oak-water hickory type, stands averaging more than 2,500 board feet per acre will often produce less than 1,000 board feet of high-grade material. Interpretation of tables involving area and volume of stands bearing 2,500 board feet per acre will have to be tempered accordingly.

The forest area supporting 2,500 or more board feet per acre is shown in Table 4, classified by forest conditions and forest types.

Table 4. - Forest area having 2,500 or more board feet[1] per acre classified by forest conditions and forest types- Bottom-land Hardwood Unit in Mississippi

Forest conditions	Forest types				Total	Percent of forest area having 2,500 or more board feet per acre
	Cypress-hardwood	Cotton-wood - willow	Overcup oak - water hickory	Mixed hardwood		
	----------Area in acres----------					
Old-growth	4,500	----	22,700	54,300	81,500	11.8
Old-growth culled	21,100	----	34,000	31,000	86,100	12.5
Old-growth cut-over	27,200	----	43,800	81,500	152,500	22.1
Second-growth	21,900	37,000	27,100	210,600	296,600	42.9
Second -growth cut-over	5,300	4,500	1,500	62,700	74,000	10.7
Total	80,000	41,500	129,100	440,100	690,700	
Percent of forest area having 2500 or more board feet per acre	11.6	6.0	18.7	63.7		100.0

[1] By Scribner log rule. This volume includes sawlogs, ties, timbers, stave material, and rough - structural and small - dimension lumber.

Saw-timber in merchantable trees

Before considering the timber volume information given in the following tables, a clear statement is necessary defining terms and presenting conceptions of southern-hardwood forest-utilization-practice. Some of the board-foot volume-estimates are given in both the Scribner and the Doyle log rules. The former is recognized by the United States Forest Service and the latter is the only log rule commonly used by lumbermen in the South.

These volumes do not make any allowance for breakage during the logging operation. The volume in any given tree was measured to the height that included the maximum number of merchantable logs of standard lengths, namely, 8, 10, 12, 14 and 16 feet. To be merchantable, a log had to be at least 8 feet long and 10 inches in diameter inside bark at the small end; it had to be relatively straight and free from numerous large knots; and at least 50 percent of its volume had to be suitable for lumber, ties, timbers, stave bolts, or rough-structural or small-dimension material. Although 10 inches was the irreducible minimum top diameter, no fixed top diameter was used; the merchantable length extended only as high as the individual tree stem would produce merchantable logs. At this merchantable limit the stem diameter was frequently 12 and 14 inches, and sometimes larger.

The term "gross volume"refers to the full board-foot content of merchantable trees from stump to top of last log, and includes both woods and mill cull. In general, a tree was considered merchantable if it was 13.0 inches or over in diameter outside of bark at a point 4½ feet above the ground and if 50 percent of its volume met the quality and size specifications for merchantability given in the preceding paragraph. In the case of large specimens of such valuable timber species as red gum, cypress, white and red oaks, and ash, trees having a smaller percentage of merchantable volume were considered to be merchantable. This minimum percentage varied with individual trees, but was seldom less than 30 percent.

Excepting cypress and large red gum, dead trees are not included in the merchantable volume estimates. Since dead heartwood of cypress is highly resistant to decay and is commonly used by sawmill operators, the volume of all dead cypress trees of merchantable size is included. The exceedingly high value of sound, dead heartwood of large, old-growth red gum justifies its inclusion also.

Table 5 shows by forest conditions the gross volume for the unit and for the area supporting 2,500 or more board feet per acre.

Table 5. - Gross board-foot volume of merchantable trees, classified by forest conditions,[1] Bottom-land Hardwood Unit in Mississippi

Forest conditions	All forest area		Forest area having 2,500 or more board feet per acre	
	Scribner log rule	Doyle log rule	Scribner log rule	Doyle log rule
	Thousand feet board measure			
Old-growth	800,000	751,130	784,530	738,070
Old-growth culled	660,900	585,400	631,760	558,290
Old-growth cut-over	1,048,800	926,060	790,950	711,950
Second-growth	2,092,900	1,781,330	1,585,300	1,373,140
Second-growth cut-over	485,900	407,380	325,960	280,950
Total	5,088,500	4,451,300	4,118,500	3,662,400

[1] A negligible volume of live timber was found in the fire-killed and flood-killed conditions. This volume is not included in the volume figures for the Unit, given in Tables 5, 6, 8, 9, and 10.

The volume of merchantable trees was classified into high-grade and low-grade material. According to Forest Survey definitions, high-grade timber includes the volume of any log that, in the opinion of the cruiser, would produce at least 35 percent of its volume in number 1 common lumber or better. A log of this quality produces, on an average, 50-60 percent of its volume in number 1 common lumber or better. Low-grade timber includes the volume of any log that meets the minimum specifications for merchantability, but which will not produce 35 percent of its volume in number 1 common lumber or better. This low-grade timber is principally suited[2] for ties, timbers, stave bolts, and rough-structural and small-dimension lumber.

[2] Of the quantity of low-grade timber approximately 20 percent is suitable for cooperage bolts and small-dimension lumber. To be suitable for these two uses, timber can be of a smaller size than that required to produce ties, timbers, and rough-structural lumber, but it must have the quality of high-grade timber.

Table 6. - Board-foot volume of merchantable trees, classified by species groups, Bottom-land Hardwood Unit in Mississippi

Species groups	Total forest area					Forest area having 2500 or more board feet per acre	
	Gross volume 1/		Net volume - Scribner log rule			Gross volume 1/	
	Scribner log rule	Doyle log rule	High-grade timber 2/		Low-grade timber 3/	Scribner log rule	Doyle log rule
	Thousand feet board measure		Thousand feet board measure	As a percent of gross volume	Thousand feet board measure		
White oak	57,820	50,060	23,380	40	33,460	31,890	28,560
Red oak	43,030	37,020	13,000	30	28,760	23,040	20,440
Water oak	637,700	575,990	232,600	36	362,710	484,510	446,330
Overcup oak	798,920	731,580	270,900	34	497,350	683,180	632,870
Red gum	588,530	537,120	271,370	46	289,340	527,770	485,910
Hickory	29,860	24,250	7,530	25	21,460	15,730	13,170
Cottonwood - willow	545,910	469,820	286,800	53	244,430	482,260	420,790
Ash	163,080	133,280	81,760	50	72,090	116,570	94,720
White elm - hackberry	455,130	377,930	131,590	29	305,420	302,060	256,080
Cypress	443,030	392,070	398,980	90 4/	5/	409,170	366,160
Tupelo gum - black gum	285,440	202,810	126,980	44	141,470	232,090	167,490
Cedar elm - water hickory	683,620	601,600	286,320	42	368,360	518,820	463,870
Others	336,530	302,160	164,980	49	154,670	277,410	255,080
Specials	19,900	15,610	6/	6/	6/	14,000	10,930
Total	5,088,500	4,451,300	2,296,190	45	2,519,520	4,118,500	3,662,400

1/ Includes volume of sound and defective wood.
2/ Net log scale at mill deck. This is the gross volume of high-grade timber less both woods cull and mill cull.
3/ Net log scale in woods. This is the gross volume of low-grade timber less woods cull only.
4/ Cull accounts for 10 percent of the gross volume of cypress.
5/ All cypress volume was considered to be high-grade.
6/ Specials are not graded into log grades.

Woods cull is that part of the stem that would under usual logging practice be left in the woods on account of defect. Mill cull is the volume of material lost in sawing defect from logs in the sawmill. Table 6 shows, by species groups, the gross volume in merchantable trees, including woods and mill cull; the net volume of high-grade timber, after deducting both woods and mill cull; and the net volume of low-grade material, after deducting woods cull.

Table 7 shows, by major species groups, the woods and mill cull percentages that can properly be applied to the gross volume of merchantable trees to get net volumes. These percentages are based on a study of the cull found in merchantable trees only, and are in no way influenced by the volume in cull trees. Of the cull volume found in merchantable trees approximately 50 percent was directly or indirectly caused by fire. The indirect fire loss is largely the cull volume caused by rot that entered the tree through fire scars.

As the rot continues to spread it gradually reduces the volume of sound material in a given tree until the tree eventually becomes a rotten cull - i. e., contains more than 50 percent of its volume in decayed wood.[1] The gross volume of rotten cull trees of saw-log size in this unit is significant; if all the rotten cull trees in the unit had been entirely sound they would have contained 1,193,000,000 board feet of merchantable material.

In addition to rotten cull trees there is in the unit a considerable number of sound cull trees - those that are culled on account of extreme limbiness, crookedness, or forking of the central stem. The volume in sound cull trees was not determined, and had no influence on the percentages shown in Table 7.

---

[1] A particularly large, high quality tree having somewhat more than 50 percent of its volume in decayed wood sometimes was classified as merchantable. The defective material seldom exceeded 70 percent.

Table 7. - Average woods-cull[1] and mill-cull[2] percentages for merchantable trees

Species groups	Woods cull - percent of gross volume (Scribner log rule)		Mill cull - percent of log scale at mill deck. (Scribner log rule)
	Original timber[3]	Residual and second-growth timber[4]	All forest conditions
	Percent		
White oak	.5	.9	2
Red oak	.9	1.8	4
Water oak	2.6	5.1	5
Overcup oak	1.3	2.4	5[5]
Red gum	1.9	3.4	[6]
Hickory	1.3	2.6	2
Cottonwood - willow	-	.5	4
Ash	2.5	3.0	5
White elm - hackberry	.8	1.7	7
Cypress	1.0	[7]	8
Tupelo gum - black gum	1.4	4.8	5
Cedar elm - water hickory	1.0	2.1	5
Others and specials	2.6	3.7	3

[1] Woods-cull percentages were determined from an analysis of the woods-cull deductions made by cruisers for the merchantable sample trees on survey sample plots. In no instances were these percentages based on the cull volume in cull sample trees.

[2] Mill-cull percentages were obtained by the Forest Products Laboratory, U. S. Forest Service, Madison, Wisc., in a series of mill-scale studies made at eight sawmills situated in the bottom-land hardwood region of Louisiana, Arkansas and Mississippi.

[3] Original timber includes old-growth and old-growth culled forest conditions.

[4] Residual and second-growth timber includes old-growth cut-over, second-growth and second-growth cut-over forest conditions.

[5] This percentage would be somewhat higher were it not for the considerable quantity of "sound wormy" overcup oak lumber that is accepted in the hardwood industry.

[6] Percentage of mill cull in red gum: old-growth conditions 5%, second-growth conditions 2%.

[7] Percentage of woods cull in cypress: old-growth cut-over condition 5.7%, second-growth and second-growth cut-over conditions .4%.

Pulpwood

In addition to the volume of saw-timber, the Mississippi Bottom-land Hardwood Unit has an important supply of pulpwood. Species suitable for pulp are red gum, cottonwood, willow, cypress, tupelo and black gum, red and silver maple. Where timber size and quality will permit, lumber manufacture is assumed to be the most profitable use of the hardwood pulping species. Accordingly, the pulpwood estimate of 1,830,000 cords includes only the volume in sound trees 5.0 inches or over in diameter and below the minimum lumber size, i.e., 13.0 inches in diameter, at a point 4½ feet above the ground. A sound tree is one in which 50% or more of the gross volume is sound. It includes that part of each stem up to 4 inches in diameter at the top, which in the judgment of the cruiser could be converted into pulpwood. It does not include the unutilized tops of trees that would be felled for lumber.

Number of sound trees and volume for the average acre

Table 8 shows, by diameters of trees, the number of trees and volume of timber on the average acre of land in each forest condition. The cubic-foot volume includes the gross volume to a 4 inch top in sound trees 5.0 inches or over in diameter and below saw-timber size. The board-foot volume includes the gross volume in merchantable trees of saw-log size, i.e., 13.0 inches or over in diameter.

Table 9 gives similar information for stands having a gross volume per acre of 2,500 or more board feet. These two tables show that there is no present dearth of trees of small size.

Table 8. - Number of trees and gross volume of timber on the average acre of forest land, by forest conditions and diameters of trees, Bottom-land Hardwood Unit in Mississippi

Forest conditions		Tree diameters in inches at breast height																						Totals for average acre		
		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44 up	No. of trees 1/	Volume cu. ft.	Volume bd. ft. 2/
Old-growth	No. of trees 1/	43.3	15.3	15.3	5.7	5.9	4.8	3.84	3.48	2.34	2.47	1.92	1.69	1.33	1.11	.98	1.30	.55	.39	.49	.20	.10	.46	113.0		
	Vol. cu. ft.	-	-	35.2	33.6	64.9	87.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		221.5	
	Vol. bd. ft. 2/	-	-	-	-	-	-	240	329	313	478	499	590	638	614	636	1104	579	502	708	288	216	886			8620
Old-growth culled	No. of trees 1/	25.3	12.2	11.0	5.5	5.8	5.1	5.34	4.40	4.31	3.54	3.02	2.81	1.44	.95	.76	.55	.31	.49	.31	.21	.06	.27	93.7		
	Vol. cu. ft.	-	-	25.3	32.4	63.8	93.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		214.8	
	Vol. bd. ft. 2/	-	-	-	-	-	-	295	364	490	583	676	813	519	475	459	375	243	408	281	216	56	430			6683
Old-growth cut-over	No. of trees 1/	48.0	11.7	8.4	5.1	4.2	3.7	3.15	2.51	2.11	1.53	1.21	.96	.42	.43	.21	.17	.12	.09	.04	.07	-	.08	94.2		
	Vol. cu. ft.	-	-	19.3	30.1	46.2	67.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		163.3	
	Vol. bd. ft. 2/	-	-	-	-	-	-	197	231	279	287	304	316	163	208	111	104	106	90	44	68	-	153			2661
Second-growth	No. of trees 1/	159.6	45.7	23.2	11.1	7.8	6.1	4.40	3.18	2.24	1.46	.99	.71	.31	.18	.10	.11	.06	.02	.02	.02	.02	.03	267.4		
	Vol. cu.ft.	-	-	53.4	65.5	85.8	111.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		316.3	
	Vol. bd. ft. 2/	-	-	-	-	-	-	289	314	326	304	283	267	142	90	63	92	51	25	28	29	25	70			2398
Second-growth cut-over	No. of trees 1/	104.2	30.2	17.8	8.6	6.9	5.6	4.20	3.27	2.28	1.49	.64	.59	.15	.15	.08	.08	.04	.01	.01	-	-	.01	186.3		
	Vol. cu. ft.	-	-	40.9	50.7	75.9	102.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		270.0	
	Vol. bd. ft. 2/	-	-	-	-	-	-	282	332	334	325	193	222	64	88	52	52	32	15	15	-	-	12			2016

1/ Merchantable or sound trees only. Cull trees are not included.

2/ By Scribner log rule. This volume includes saw-logs, ties, timbers, stave material, and rough-structural and small-dimension lumber.

Table 9. - Number of trees and gross volume of timber on the average acre of forest land having 2,500 or more board feet per acre, by forest conditions and diameters of trees, Bottom-land Hardwood Unit in Mississippi

Forest conditions		Tree diameters in inches at breast height																						Totals for average acre		
		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44 up	No. of trees 1/	Volume cu. ft.	Volume bd. ft. 2/
Old-growth	No. of trees 1/	37.0	15.2	15.9	5.7	5.9	5.3	3.85	3.74	2.44	2.70	2.07	1.93	1.44	1.22	1.11	1.48	.63	.44	.56	.22	.11	.48	109.4		
	Vol. cu. ft.	-	-	36.6	33.6	64.9	97.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		232.1	
	Vol. bd. ft. 2/	-	-	-	-	-	-	241	355	327	526	540	672	700	683	724	1258	659	572	806	328	246	989			9626
Old-growth culled	No. of trees 1/	25.3	12.6	10.9	5.1	5.8	5.2	5.58	4.18	4.67	3.72	3.37	3.02	1.61	1.02	.84	.60	.35	.56	.35	.25	.07	.32	95.4		
	Vol. cu. ft.	-	-	25.1	30.1	63.8	95.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		214.2	
	Vol. bd. ft. 2/	-	-	-	-	-	-	306	341	526	618	754	881	587	520	509	420	279	469	323	248	64	493			7338
Old-growth cut-over	No. of trees 1/	49.9	12.3	8.5	5.4	4.4	3.8	4.44	3.52	3.35	2.46	2.24	1.86	.79	1.01	.44	.42	.30	.24	.10	.16	-	.20	105.8		
	Vol. cu. ft.	-	-	19.6	31.9	48.4	69.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		169.4	
	Vol. bd. ft. 2/	-	-	-	-	-	-	276	326	445	462	566	613	313	500	249	265	265	233	114	165	-	395			5187
Second-growth	No. of trees 1/	92.0	31.6	17.4	10.5	8.8	8.3	6.94	6.02	4.52	3.09	2.24	1.66	.70	.42	.25	.30	.15	.07	.07	.06	.05	.10	195.2		
	Vol. cu. ft.	-	-	40.0	61.8	96.6	151.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		349.8	
	Vol. bd. ft. 2/	-	-	-	-	-	-	453	599	666	658	661	638	342	228	171	260	145	74	82	86	75	207			5345
Second-growth cut-over	No. of trees 1/	67.3	30.2	15.1	8.1	7.6	5.7	5.51	5.35	4.16	3.63	1.55	1.51	.41	.49	.24	.24	.12	.04	.04	-	-	.04	157.3		
	Vol. cu. ft.	-	-	34.7	47.8	83.6	104.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		270.4	
	Vol. bd. ft. 2/	-	-	-	-	-	-	367	544	608	795	474	564	188	285	168	169	104	50	50	-	-	39			4405

1/ Merchantable or sound trees only. Cull trees are not included.

2/ By Scribner log rule. This volume includes sawlogs, ties, timbers, stave material, and rough-structural and small-dimension lumber.

Forest Growth and Drain

Forest growth estimate

The basic data for the growth calculations were gathered on 2,412 sample trees randomly selected on the forest plots established in the Unit. The following measurements were taken on each of these trees: diameter at 4½ feet above the ground, merchantable height, and radial growth during the preceding ten-year period. The probable average yearly timber growth in the Unit has been calculated for the ten-year period from 1932 to 1942. In these calculations the annual timber cut is assumed to be equal to the annual growth. Appropriate deductions have been made for the timber volume lost as a result of wind-fall, fire, disease and other natural causes. Table 10 shows the annual board-foot volume growth.

Thus the volume of growing stock constant from yr. to yr.?

Table 10. - Annual board-foot volume growth[1] for the period 1932-42, assuming that a cut equal to the annual growth is made each year, Bottom-land Hardwood Unit in Mississippi

Forest conditions	Annual gross volume growth			Annual net volume growth - for unit		
	For unit	Per acre	Percent of the 1932 gross volume	High-grade[2] timber	Low-grade[3] timber	Total
	M. ft. b. m.	ft. b. m.	Percent	M. ft. b. m.		
Old-growth	12,000	129	1.5[4]	6,480	5,040	11,520
Old-growth culled	15,610	158	2.4	8,740	6,090	14,830
Old-growth cut-over	32,090	81	3.1	13,160	17,010	30,170
Second-growth	116,030	133	5.5	48,730	61,500	110,230
Second-growth cut-over	24,980	104	5.1	9,740	14,240	23,980
Totals and weighted averages	200,710	118	3.9	86,850	103,880	190,730

[1] By Scribner log-rule.
[2] Gross woods volume of high-grade timber less woods cull and mill cull.
[3] Gross woods volume of low-grade timber less woods cull but including mill cull.
[4] Bottom-land hardwood forests are characteristically all-aged. That the current annual growth rate in this condition is as high as 1.5% is largely due to the rapid growth of the young trees found in stands in the old-growth condition.

Forest drain estimate

Until the recent organization of the Lumber Code Authority no complete figures on lumber manufacture in this Unit were available. Even now, information on the cut of timber for hewed railroad ties, cooperage, poles, posts, piling, and fuel wood is not currently recorded by any statistical organization. Accordingly, the final report of the Forest Survey on timber drain cannot be prepared until the recently formed organizations for securing statistics on forest utilization have had time to assemble sufficient data to warrant authoritative statements concerning the quantity of wood actually used. There is, however, a present need for an approximate forest drain estimate that can be compared with present growth to ascertain whether or not the timber stands of the Unit are being depleted.

Table 11 gives an estimate of the material that will be cut from this Unit during the calendar year 1934. It is based upon the cut reported to the Lumber Code Authority for the first 4 months of the year. In estimating this annual cut, reasonable allowance has been made for the normal, seasonal fluctuation in timber production.

Table 11. - Estimate of saw-timber cut[1] for calendar year 1934

Use for which timber is cut	High-grade timber	Low-grade timber	Total
	Thousand feet board measure		
Lumber[2]	52,260	32,780	85,040
Cooperage stock	2,300 *	9,700 *	12,000 *
Pulpwood	900 *	7,200 *	8,100 *
Fuel wood[3]	12,260 *	68,620 *	80,880 *
Miscellaneous[4]	1,700 *	6,100 *	7,800 *
Total	69,420	124,400	193,820

[1] By Scribner log rule.

[2] Includes commercial veneer.

[3] Also includes the volume of timber cut but not otherwise utilized when forest land is cleared for agriculture.

[4] Includes poles, piling, posts, hewed and round ties, hewed and split pieces used in logging and local construction work.

* Although this material is not actually used as saw-timber, it has the quality of high-grade or low-grade timber as defined on page 11.

Comparison of the volume of forest growth and forest drain

Comparison of the annual net board-foot timber growth of the Unit with the total annual drain shows that the growth of high-grade and low-grade material combined is only 3,090,000 board feet less than the drain. The annual growth of low-grade material is considerably less than the yearly cut of this grade of timber. On the other hand, the annual growth of high-grade material exceeds the yearly cut of high-grade timber by 17,430,000 board feet. Growth appears to be more than replacing the volume of high-grade timber removed at the present rate of cutting. However, approximately 85 percent of the growth of high-grade material is taking place in the forest conditions where the stand volume per acre is commonly too low to support a commercial operation at the present time. In contrast, a large part, probably 75 percent, of the present cut is being concentrated in the old-growth stands. From this it is apparent that the high-grade material now being grown will not be as easily and as cheaply harvested as the present supply of high-grade timber in old-growth and old-growth culled stands.

During 1934 the sawmills of the Unit have been operating at about 37 percent of their capacity. With improvement in the present lumber market, operators of these mills will probably desire to increase their production and thus liquidate their investment in standing timber. Any considerable increase in the cut of high-grade timber will overtax the capacity of the Unit to supply such material on a continuous basis. According to conservative estimates 300,000 man-days of labor are needed in the logging and manufacture of the 1934 commercial cut in the Mississippi Bottomland Hardwood Unit. If forests are cut no faster than they grow, there is reasonable assurance that this amount of labor can be continuously employed in logging and manufacturing in the Unit.

Summary

Of the 4,420,400 acres in the Bottom-land Hardwood Survey Unit in Mississippi, 1,736,900 acres, or approximately 40 percent, is forest land. Eleven percent of the forest area bears uncut or lightly-culled old-growth timber stands. The remainder of the forest area is either cut-over timber land or supports a second-growth forest which may or may not be of merchantable size. On a very small percentage of the forest area all of the timber has been killed by fire or flood.

The net timber volume in the Unit, expressed in the Scribner log rule, is 2¼ billion board feet of high-grade[1], and 2½ billion board feet of low-grade[2] material. A part of the volume of high-grade timber is found in occasional trees scattered on areas already cut over. From the point of view of practicable logging, it is not now feasible to harvest all of this high-grade material.

Assuming an annual timber cut that is equal to the annual growth, the Bottom-land Hardwood Unit in Mississippi has a net annual growth of 190,730,000 board feet. The best available data on the volume of timber cut from the forests in the Unit fix the current annual drain at 193,820,000 board feet of material of saw-timber size. Thus the growth of high-grade and low-grade material combined is slightly less than the forest drain. Forty-six percent of the net timber growth of the Unit, or 86,850,000 board feet, is in high-grade material. This growth exceeds the drain of high-grade timber by 17,430,000 board feet. It must be remembered, however, that the growth of high-grade material is taking place on trees distributed widely throughout the unit; on the other hand, the drain of high-grade timber is chiefly confined to those restricted areas supporting heavy stands of old-growth timber or merchantable stands of second-growth.

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[1] Net log scale at mill deck. This is the gross volume of high-grade timber less both woods cull and mill cull.

[2] Net log scale in the woods. This is the gross volume of low-grade timber less woods cull.

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